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APPLICATION OF ORDINAL LOGISTIC REGRESSION ANALYSIS IN DETERMINING THE RISK FACTORS FOR INTELLIGENCE QUOTIENT OF SCHOOL GOING CHILDREN

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ABSTRACT

Background: The focus of our study is to estimate the risk factors which influence the IQ level of school going children.

Method: A cross sectional study in which we explored the IQ of school going children in the age group (11-17) and analyzes the factors associated with malnutrition, education and socio economic status with the help of designed questionnaire and anthropometric measurement from April 2015-March 2016 in Urban and rural blocks of Jammu division and develop Ordinal logistic regression model. Intelligence Quotient Score by Dr. P. Shrinivasan verbal intelligence test collected in pre-designed questionnaire in the class room without the presence of school administration so that student feel free in the class room to fill the information given in the questionnaire explained by the researcher.

Result: Out of 880 children screened, nearly (43) 4.9 % students were superior, (282) 32% students were average student, and (376) 42.7% were borderline and (179) 20.3% were feeble minded. Superior incidence of intelligence is found among the highest SES class i.e. 6(10%) and feeble minded were found among the poor class i.e. 32(21.2%). The logistic regression for school going children shows that the normal weight children has no significant affect on feeble minded children which means normal weight children has adequate IQ level., The odd ratio of SES i.e. 2.24 which is greater than odd ratio of BMI (Nutrition) i.e. 0.88 which indicates that the IQ has been affected more due to SES than BMI (Nutrition) status of children. Thus the IQ status of school going children is associated with nutritional, socio economic status, education status of mother, age group of children is positively correlated to the nutritional, educational, and socio economic status of their parents.

Conclusion: Bearing in mind the status of IQ among the school going children and burden of malnutrition among school children there is need for periodic screening, awareness at school and parent counselling.

KEYWORDS: IQ, Nutritional, educational status, socio economic status, BMI, school children.

Introduction

The intelligence quotient (IQ) represents a composite score on a variety of tests designed to measure a hypothesised general ability or intelligence However, there are a limited number of studies looking specifically at IQ levels in people. It is expected that examining the available literature in this area would be helpful in providing information about intellectual functioning, investigating how comparable neuropsychological studies from different academic groups are in the context of IQ estimation, helping to clarify what the most appropriate IQ measure would be for future studies, and exploring any association between severity of illness (measured by Body Mass Index (BMI)) and IQ levels. We conducted a survey on school going children of Jammu division to determine the risk factor affecting their IQ. Globally, about 668 million children are studying at the elementary school level, which is the largest proportion of the total population [2].The growth and development of these children progress simultaneously and are influenced by different factors [3]. Growth and development starts before infancy and continues up to the adolescent period [4]. Physical growth is the geometric growth of cells and can be directly observed. The growth of height, weight, and head and chest circumference are part of physical growth and increase vital signs as well as physiological ones [5].Height and weight can be measured by body mass index (BMI). Likewise, child development can be observed in motor, emotional, social and cognitive developments [6, 7]. Compared to physical growth, it is difficult to measure cognitive development. There are some special tests to measure different types of development of children, and intelligence quotient (IQ) testing is one method to measure cognitive development. Regarding the IQ of children, it is very difficult to predict and it can vary according to geographical location, age, gender, socio-economic factors [8], poor diet with high fat [9], and school environment [10]. Currently, the problem of child obesity has been highlighted in developed countries but factors related to child growth and development in developing countries are less noticed [11–13]. Globally, more than one-third and 60% of families in developing countries are suffering from poor nutrition and this impact would reflect in the physical and cognitive development of children [14, 15]. The prevalence of underweight children is four times higher (24%) in the rural areas of India in comparison with obese children [16]. The BMI of children was average in those areas where parent education was good [17–20]. Likewise, the IQ of children is influenced by the consumption of several nutritional factors [21]. Boss [25] and Robert Havighurst [26] have developed a theory of physical growth and cognitive development. It explains that individual factors such as age, gender, disease/illness, and household factors such as economics, food consumption pattern, education, school environment, as well as other factors related to gene and hormone composition, influence the BMI and IQ of children. Social inequality during the childhood period and the social context are equally responsible for child health status and overall development, including intelligence [27]. Studies in South Asia, including Indonesia, Malaysia, Thailand and Vietnam, reveal that undernourishment and poor IQ level should be explored together [28]. Nevertheless, most previous studies explored the situation of abnormal children rather than apparently healthy children, focusing on the social context and school environment in relation to physical growth and cognitive status especially in children from elementary school. There are rare studies related to the BMI and IQ of children in developing countries and especially in remote areas. In those areas, there is a high proportion of poverty and food insecurity. Current studies focus more on genetic and disease-related factors affecting IQ and BMI rather than socio-economic factors. In Nepal, more than half of children less than three years of age [29] and about one-fifth of preliminary school children suffer from stunting and underweight, and the prevalence is higher in remote and ultra-poor families [30]. The National Demographic Health Survey (NDHS) 2011 revealed that in mountain districts of Nepal, including the Humla district, 29% of children below the age of five years were underweight, 8% were severely underweight, 11% were wasted, 3% were severely wasted, 41% were short for their age and 16% were severely stunted [31]. Humla is a very remote area of Nepal where about half of the population is under the poverty line. Food insecurity is extreme because there is less production of food and locally produced food is perceived as less nutritious and most of the people rely on imported food [32]. Transportation of food by air is expensive and is done by porters, which takes a long time. As a result, a proportion of nutrients is lost during the time of carrying and storage [33]. One-third of the children are not enrolled in school and the drop-out rate is also high [34]. Further, the environment is not appropriate for learning since most of the parents have had no formal education [35]. In the Humla district, 28.2% of children were undernourished, 8.8% were wasted and 22.4% were stunted among those less than five years old [36], but the nutritional status and the IQ level of elementary school children are seldom investigated. The theory of physical growth and cognitive development and empirical findings indicate that socio-economic factors, parents' education and food sources affect the BMI and IQ of school children. So, the aim of this study is to identify and model the risk factors for IQ of school going children of Jammu division. Despite controversies about the meaning and nature of general intelligence, few would dispute the claim that scores on standardized intelligence quotient (IQ) tests are strong predictors of important outcomes for members of both majority and minority groups. IQ scores are not immutable; repeated IQ testing during childhood reveals considerable change within individuals (37). However, the causes of IQ change (beyond unreliability) remain unclear. An inverse relation between IQ and age has been reported in groups of children living under various conditions of deprivation (38-41). This evidence, which suggests a decline in IQ with increasing age among socially disadvantaged children, is based on cross-sectional studies of a typical groups conducted several decades ago. Furthermore, familial and community contributions to IQ change were not distinguished in these studies.

Method

The study is school-based cross-sectional descriptive study. This study represent the middle school students of class (8th) from urban and rural areas, belonging to both sexes studying in the Govt and the Non-Govt schools of Jammu division from the Jammu and Samba district . In our study we apply multistage sampling technique and cluster sampling technique to select required number of sample. The schools with at least 10 students in class 8th will be eligible for the study.

Eligible schools will be stratified into govt. and non govt categories from rural and urban areas of Jammu district and Samba district of Jammu division. Then, required number of schools will be selected on the basis of probability proportional to sample size (pps) i.e the schools with high number of students are more likely to be selected than school with low number of students.

Daniza, M.I. et al. reported that prevalence of low IQ in non govt school was 11.5%.On the basis of this study ,we assumed the same prevalence of low IQ and usual constant α=0.05, β=0.20, power of study 80% and margin of error is 6.5% [41]. The calculated sample size for our study is 480 students from non-govt school and Govt Schools of Jammu district and 400 students are selected from non-govt school and Govt Schools from Samba district. Finally, the required sample size for our study is approximately Eight hundred eighty (880).

The study was carried out in the randomly selected 11 blocks from rural area and urban local bodies of two districts (Jammu and Samba) of Jammu division. To represent the rural sample we was randomly selected 22 villages from 11 blocks of two districts and make list of schools. Then from the list of school we was randomly selected 4 schools including Govt. School and Non-Govt. School equal in numbers affiliated to Jammu Kashmir Board of Secondary Education (JKBOSE) from each Block of two district. Then from the each school 20 student including boys and girls will be selected from class 8th. The same procedure will be followed for the selection of urban student from the Govt. schools and private schools by keeping the complete representation of whole area of selected 2 districts. This type of technique is very useful when the population compose of strata of different sizes so that representative sample must contain individual from each category stratum in accordance with size of sub group.

The background information of student will be collected by personal interview and referring to the school registers. It includes name, age, gender, class, caste, occupation of parents, education of parents and family composition, type of house and socio-economic, personnel habits during gestation period, health complaints ,low birth weight, blood pressure. Intelligence Quotient Score by Dr. P.Shrinivasan verbal intelligence test collected in pre-designed questionnaire in the class room without the presence of school administration so that student feel free in the class room to fill the information given in the questionnaire explained by the researcher.

To estimate and analyse the factors due to which there is variations in IQ level of students in urban and rural areas a lot of methods and tests were used. In our study we use the most appropriate and broadly used method to measure the IQ of children which is Dr. P.Shrinivasan verbal intelligence test it's an Indian adaptation for scoring IQ of children in the age-group (11 to 17 yrs). Test results include a Full Scale IQ score as well as age-equivalent rankings and scores for Classification, Analogy, Assigning artificial values to arithmetical signs, reasoning.

To measure Intelligence Quotient (I.Q) our society has developed various means for the formal evaluation of intelligence. The term intelligence quotient generally describes score or grading on a test that rates the subject cognitive ability as compare to the general population.

Intelligence Quotient (IQ): Measure of intelligence that takes into account a child's mental and chronological age

IQ Score = MA / CA x 100

Mental age (MA): the typical intelligence level found for people at a given chronological age

Chronological age (CA): the actual age of the child taking the intelligence test. Intelligence quotient (IQ) is an age-related measure of intelligence level and is described as 100 times the mental age. The word 'quotient' means the result of dividing one quantity by another, and a definition of intelligence is mental ability or quickness of mind.

Intelligence quotient (IQ) is a standardized measure of human intellectual capacity that takes into account a wide range of cognitive skills. IQ is generally considered to be stable across the lifespan, with scores at one time point used to predict educational achievement and employment prospects in later years.

According to Dr. P. Shrinivasan verbal intelligence test there are four sub-test are

1).Classification
2).Analogy
3).Assigning artificial values to arithmetical signs
4).Reasoning

"Intelligence means an innate ability to solve problems."Innate ability is that which is present in a person from birth and not learnt through self-study or as a result of class room instruction".

The general classification of Intelligence score according to Dr P. Shrinivasan verbal intelligence test are represented in below mentioned table

Classification	Range
Genius/Gifted	140 and above
Very Superior	125-139
Superior	110-124
Average	90-109
Borderline	75-89
Feebleminded	50-74
Imbecile	25-49
Idiot	0-24

Child nutrition is a major public health issue in developing countries.BMI is a very useful indicator to calculate the nutritional status of school children. The accuracy of BMI varies substantially according to the individual child's degree of body fatness. BMI was calculated by dividing the weight (in Kg) by height squared (in m^2)

$$\text{BMI} = \frac{Weight(kg)}{Height^2\,(m)}$$

We used the percentile for respective reported by Centre for Disease control (CDC) for this purpose. Among obese children (or a BMI greater than or equal to the 95th percentile), BMI is a good indicator of excess body fat. However, among overweight children (or a BMI between the 85th and 95th percentile), elevated BMI levels can be a result of increased levels of either fat or fat-free mass. Similarly, among relatively thin children, differences in BMI are often due to differences in fat-free mass.

Percentile Ranking	Weight Status
Less than 5th percentile	Underweight
5th percentile to less than 85th percentile	Healthy weight
Equal to or greater than the 85th percentile	Overweight

Socioeconomic status (SES) is a measure of an individual's or family's economic and social position in relation to others, based on various variables responsible for that like income, education, occupation, family effluence, physical assets, social position, social participation, political influence, etc. SES classification namely Kuppuswami scale11 is widely used to measure the socio-economic status of an individual in urban communities. It is based on three variables namely education, occupation and income. Letter on modification of Kuppuswami scale were done, where the education and occupation of head of the family and income per capita per month was used. For the rural areas, Pareekh classification became popular based on nine characteristics namely caste, occupation of family head, education of family head, level of social participation of family head, landholding, housing, farm power, material possessions and type of family.

This scale consisted of 19 items. Suitable weight-age was given to each item and scoring for each item was based on a scale ranging from 0 to 7. The maximum aggregate score was 91. Based on the final score, the socio-economic states of the family is divided into Four socio-economic categories, namely Upper high (combined score of more than 68), High (52-67), Middle (38-51), Poor (combined score less than 37). In the present study, the instrument was used to assess the socio-economic status of all strata of the society.

Socio economic Scoring System

Socio Economic Status Score	Total
Upper High	≥68
High	52-67
Middle	38-51
Poor	≤37

After calculation all the data were compiled and analyzed and appropriate Statistical tests were applied. Statistical analysis was accomplished using SPSS v. 20.

We used ordinal logistic regression model in order to determine the risk factor i.e. nutritional, educational and socio-economic factors affect the IQ of school going children.

Ordinal logistic Regression Model

In an ordinal logistic regression model, the outcome variable is ordered, and has more than two levels. In our study, students 'IQ' is ordered from Superior to Feeble minded; children's proficiency in Intelligence is tested and scaled from 1 to 4.

One appealing way of creating the ordinal variable is via categorization of an underlying continuous variable (Hosmer and Lemeshow, 2000) [42].

In this article, the ordinal outcome variable of intelligence Quotient of children are coded as 1, 2, 3 and 4 (1=Superior, 2=Normal, 3=borderline, 4=feebleminded) and is categorized based on a continuous variable. Children with Superior IQ are categorized between (110-124) marks; and Average between (90-109); Borderline between (75-89); and Feeble minded between (50-74).

The distribution of Intelligence Quotient of school children is highly positively skewed. The violation of the assumption of normality makes the use of Multiple Regression inappropriate. Therefore, the ordinal logistic regression is the most appropriate model for analyzing the ordinal outcome variable in this case.

A Latent Variable Model

The ordinal logistic regression model can be expressed as a latent variable model (Agresti, 2002; Greene, 2003; Long,1997, Long & Freese, 2006; Powers & Xie, 2000;Wooldridge and Jeffrey, 2001) [43-48].

Assuming a latent variable,

$Y^* = x\beta+\varepsilon$,

Where x is a row vector (1*k) containing no constant, β is a column vector (k*1) of structural coefficients, and ε is random error with standard normal distribution; $\varepsilon \sim N(0,1)$.

Let Y^* be divided by some cut points (thresholds): $\alpha_1, \alpha_2, \alpha_3$.....$\alpha_j$. Considering the observed intelligence quotient level in the ordinal outcome, y ranging from 1 to 4 where 1=Superior, 2=Normal, 3=borderline, 4=feebleminded, define

$$Y = \begin{cases} 1, & if\ y^* \le \alpha_1 \\ 2, & if\ \alpha_1 < y^* \le \alpha_2 \\ 3, & if\ \alpha_2 < y^* \le \alpha_3 \\ 4, & if\ \alpha_3 < y^* \le \infty \end{cases}$$

Therefore, the probability of (IQ) Intelligence Quotient of school going children can be computed. For example,

$$P(y=1) = P(y^* \le \alpha_1) = P(x\beta + \varepsilon \le \alpha_1) = F(\alpha_1 - x\beta)$$

$$P(y=2) = P(\alpha_1 < y^* \le \alpha_2) = F(\alpha_2 - x\beta) - F(\alpha_1 - x\beta);$$

$$P(y=3) = P(\alpha_2 < y^* \le \alpha_3) = F(\alpha_3 - x\beta) - F(\alpha_2 - x\beta);$$

$$P(y=4) = P(\alpha_3 < y^* \le \infty) = 1 - F(\alpha_3 - x\beta);$$

The cumulative probabilities can also be computed using the form:

$$P(Y \le j) = F(\alpha_j - x\beta), \text{ where } j = 1,2, \ldots \ldots j-1 \qquad (1)$$

General logistic Regression Model

In a binary logistic regression model, the response variable has two levels, with 1= success of the events, and 0=failure of the events. The probability of success is predicted on a set of predictors. The probability of success is predicted on a set of predictors. The logistic regression model can be expressed as:

$$ln(Y') = logit[\pi(x)] = ln\left[\frac{\pi(x)}{1-\pi(x)}\right] = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_P X_P \qquad (2)$$

SPSS Plum (Polychotomous Universal Model) is an extension of the generalised linear model for ordinal response data. It can provide five types of link functions including logit, probit, complementary log-log, cauchit and negative log-log. It takes the forms as follows:

$$logit[\pi(Y \le j|x_1, x_2, \ldots . x_p)] = ln\left(\frac{\pi(Y \le j|x_1, x_2, \ldots . x_p)}{\pi(Y > j|x_1, x_2, \ldots . x_p)}\right) = \alpha_j + (-\beta_1 X_1 - \beta_2 X_2 + \ldots\ldots - \beta_P X_P) \qquad (3)$$

Where α_j's are the thresholds, and $\beta_1, \beta_2, \ldots\ldots \beta_p$ are logit coefficients; j=1,2.....j-1.

Result & Discussion

The intelligence Quotient was categorized into four category viz. Superior, normal, Borderline, feebleminded. The proportion of Superior children was 4.9%, normal 32%, borderline 42.7% and feeble minded 20.3% in my study with sample of size 880 in Jammu Division in the year 2015. The Prevalence of children intelligence quotient with respect to selected background characteristics are shown in table.

The Proportion of Feeble minded children were found higher among the children aged (13-15) i.e. 78.8% and their SES to middle class families i.e. 79.3%, normal BMI status 86% but majority of illiterate mother were found in this category.

Table: children IQ status according to selected independent variables

We have developed the statistical model based on the incidence reporting by the school going children and their parents for Intelligence status in Jammu and samba district as follows.

$T_{IQ} = (C_A)$

Where T_{IQ} stands for total intelligence Quotient among the school going children and C_A stands for children's of adolescence age group i.e. (11-17) years. Child IQ is related to the age of the children

		Children intelligence Quotient					Pearson Chi-square (p-value)
		Superior	normal	borderline	feebleminded	Total	
Age group	11-13	16 (5.9%)	92 (34.1%)	137 (50.7%)	25 (9.3%)	270	0.000 p<0.050
	13-15	27 (4.7%)	181 (31.7%)	222 (38.9%)	141 (24.7%)	571	
	15-17	0 (0.0%)	9 (23.1%)	17 (43.6%)	13 (33.3%)	39	

In (11-13) age group, there were 92(34.1%) Average student, 137(50.7%) were Borderline, 25(9.3%) Feeble minded and 16(5.9%) were superior student. In (13-15) age group, there were 181(31.7%) Average student, 222(38.9%) were Borderline, 141(24.7%) Feeble minded and 27(4.7%) were superior student. In (15-17) age group, there were 9(23.1%) Average student, 17(43.6%) were Borderline, 13(33.3%) Feeble minded and 0(0.0%) were superior student. In our study overall we found that 16(5.9%) children in the age group of (11-13) years were superior.

Child intelligence is depending on nutrition status (BMI).

CI = (N, O, S)

Where CI stands for child intelligence and BMI is classified into three category viz. Normal, Overweight and Severe.

		Children intelligence Quotient					Pearson Chi-square (p-value)
		Superior	normal	borderline	feebleminded	Total	
BMI	Normal	32 (4.5%)	211 (29.6%)	317 (44.4%)	154 (21.6%)	714	0.000 p< 0.050
	Over weight	9 (6.8%)	64 (48.5%)	42 (31.8%)	17 (12.9%)	132	
	severe	2 (5.9%)	7 (20.6%)	17 (50.0%)	8 (23.5%)	34	

In this table we conclude that 32(4.5%) normal weight children, 9(6.8%) overweight children and 2(5.9%) severe (malnourished) belong to Superior category. Out of 880 student we observe 179 feeble minded and from this 154(21.6%) belong to normal weight, 17(12.9%) belong to Overweight and 8(23.5%) children severe (malnourished) category.

Education of mother is linked to the Intelligence Quotient among children.

E_{mf} = (I, M, HS, S, C)

Education of mother is classified as illiterate, middle, high school, secondary, college.

		Children intelligence Quotient					Pearson Chi-square (p-value)
		Superior	normal	borderline	feebleminded	Total	
Mother education	Illiterate	8 (4.3%)	42 (22.7%)	90 (48.6%)	45 (24.3%)	185	0.004 p<0.050
	Middle pass	15 (4.2%)	112 (31.3%)	160 (44.7%)	71 (19.8%)	358	
	Matric	9 (4.1%)	81 (37.0%)	81 (37.0%)	48 (21.9%)	219	
	12th	6 (8.0%)	27 (36.0%)	28 (37.3%)	14 (18.7%)	75	
	Graduate and above	5 (11.6%)	20 (46.5%)	17 (39.5%)	1 (2.3%)	43	

The mother education is playin an important role in health status and intellectual capability in children. Literate mother adopt many improved behaviours related to maternal and child healthcare, feeding, and eating practices which ultimately affect the nutritional status of child (Joshi et.al 2011)[49]. In our Present study among 185(21.02%) Illiterate mother whom 42(22.7%) children were Average student, 90(48.6%) were Borderline, 45(24.3%) Feeble minded and 8(4.3%) were superior children. Among 695(78.97%) Literate women whom 240(34.53%) children were Average student, 286(41.15%) were Borderline, 134(19.28%) Feeble minded and 35(5.03%) were superior children.

SES = (P, M, H)

Where socio economic status is classified in four categories according to Kuppuswami scale11 i.e. Poor, Middle, High.

		Children intelligence Quotient					Pearson Chi-square (p-value)
		Superior	normal	borderline	feebleminded	Total	
SES	Poor	3(2.0%)	46(30.5%)	70(46.4%)	32(21.2%)	151	0.014
	Middleclass	34(5.1%)	208(31.1%)	285(42.6%)	142(21.2%)	669	p< 0.050
	Highclass	6(10.0%)	28(46.7%)	21(35.0%)	5(8.3%)	60	

we found that 3(2.0%) and 34(5.1%) were Superior children in the Poor and the middle class. There were 6(10.0%) Superior children found in high class. And from overall we conclude that more Superior children 6(10.0%) we found in High class as compare to Poor class and Middle class.

Study by (Ghnonge et al 2015)[50] found that children from Private Schools belonged to Upper Class whereas it was so only in 27.41% of Government School children who belonged maximally to Upper Middle class 378(67.5%). Overall Prevalence of Obesity and Overweight was 5.62% and 9.99%.

All the selected independent variable was significantly associated with the IQ of children (chi square statistics and P values are mentioned in tables) which is less than P< 0.050.

Ordinal logistic regression

In ordinal logistic regression the main aim to identify the risk factor of IQ of children the study was fitted with Proportional odds model

Proportional odds model

IQ with nutrition status

All the independent variables in the POM are found significant. The P-value are shown in the last column of table, the result reveals that all the variables except the normal weight children were found insignificant (p-value=.701) with 0.85 odd ratio. This means the normal weight children has no significant affect on feeble minded children this means normal weight children has adequate IQ level. Also, there is significant association between overweight children and feeble minded children with (p value 0.14) and decrease in odd ratio 0.41 this means that children with overweight has significant affect on their IQ.

IQ with SES (Socio Economic Status)

Now we were interpreting the association between IQ and SES .the result table shows that there is significant association between children belonging to different Socio Economic Status has significant effect on IQ of children with (p value 0.005,0.003) and odd ratio 2.24, 2.15, i.e. the children belongs to different SES has effect on their IQ.

Confidence Limits for the Odds Ratio

95% Confidence limits for the odd ratio 95% Confidence Limit

CONFIDENCE LIMIT S FOR ODD RATIO

	Estimate(β)	Std Error	Wald	df	Sig	Odd ratio	95% Confidence interval	
							Lower Bound	Upper Bound
IQ_Superior	-1.868	.464	16.174	1	.000	0.154	-2.778	-.958
IQ_Normal	.633	.450	1.976	1	.160	1.884	-.250	1.516
IQ_Borderline	2.604	.458	32.289	1	.000	13.512	1.706	3.502
Age-group	.407	.120	11.562	1	.001	1.503	.173	.642
BMI_Normal	-.125	.326	.148	1	.701	0.882	-.765	.514
BMI_Overweight	-.879	.359	5.984	1	.014	0.415	-1.583	-.175
BMI_Severe	0a	.	.	0	.		.	.
SES_Poor	.811	.290	7.808	1	.005	2.249	.242	1.379
SES_Middle	.765	.255	8.981	1	.003	2.150	.265	1.266
SES_High	0a	.	.	0	.		.	.

IQ with respect to Age-group

Now we were interpreting the association between IQ and age group .the result table shows that there is significant association between children of different age group has significant effect on IQ of children with (p value 0.001) and odd ratio 1.503 i.e. the children belongs to different age group has effect on their IQ.

Logit Model for Complete Sample Analysis

= 0 .407* Age-group–0.125*BMI_Normal–0.879*BMI_Overweight +0 .811*SES_Poor+ 0.765*SES_middle

Discussion & Conclude

We use 880 observations in our data set for the analysis. In the Parameter estimate table we see that the p value in all cases less than 0.05 except the normal weight children were found insignificant (p-value=.701) with 0.85 odd ratio. Thus we conclude that the normal weight children has no significant affect on feeble minded children which means normal weight children has adequate IQ level., The odd ratio of SES i.e. 2.24 which is greater than odd ratio odd ratio of BMI (Nutrition) i.e. 0.88 which indicates that the IQ has been affected more due to SES than BMI (Nutrition) status of children. Thus the IQ status of school going children is associated with nutritional, socio economic status, education status of mother, age group of children. The Household having lowest income are not able to buy different inputs required for health and so it is positively and statistically significant. Mothers education playing an important role in health of children so from our analysis part the p value 0.004 (<0.05) indicates significant association between them. From our analysis part we found that the children in the age group (11-13) were most likely affected by malnutrition. (Srivasta et al 2012)[51], conducted a cross-sectional study of nutritional Status in school age slum children and analysed the Prevalence of stunting and underweight was highest in the age group 11-13 years.

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